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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

MOWLA, GOLAM

ART UNIT

PAPER NUMBER

1723

MAIL DATE

DELIVERY MODE

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/555,855	<b>Applicant(s)</b> OTA ET AL.	
	<b>Examiner</b> GOLAM MOWLA	<b>Art Unit</b> 1723	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 31 January 2011.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-117 is/are pending in the application.
- 4a) Of the above claim(s) 2,4,6 and 16-117 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3,5 and 7-15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                       | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>01/25/2011</u> .  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 01/31/2011 has been entered.

### ***Election/Restrictions***

2. Newly submitted claim 117 is directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: claim 117 is directed to a distinct product from that of Group I (claims 1, 3, 5 and 7-15) (MPEP § 806.05(j)). In the instant case, the product of Group I does not require "the plate shaped raw thermoelectric semiconductor materials having a first thickness greater than a second thickness, the second thickness being a greatest thickness at which the plate shaped raw thermoelectric semiconductor materials have a first oxygen concentration quantity, the first oxygen quantity corresponding to a curve-shaped function correlating oxygen concentration with thickness of the plate shaped raw thermoelectric semiconductor materials" as required by claim 117. Also the claim 117 does not require "the plate shaped raw thermoelectric semiconductor materials having a thickness of at least 70  $\mu\text{m}$ " as required by the product of Group I.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claim 117 is withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

***Response to Amendment***

3. Applicant's amendment of 01/31/2011 does not place the Application in condition for allowance.
4. Claims 1-117 are currently pending. Applicant has amended claims 1, 3, 8 and 12, and added new claim 117. Claims 2, 4, 6 and 16-117 are withdrawn from consideration as being part of non-elected invention.

***Status of the Objections or Rejections***

5. The objections to the Specification are withdrawn in view of Applicant's amendment to claims 1, 3, 8 and 12 to cancel the New Matter.
6. Due to Applicant's amendment to claims 1, 3, 8 and 12, all rejections from the office Action dated 09/02/2010 are withdrawn. However, upon further consideration, a new ground of rejection is presented below.

***Claim Rejections - 35 USC § 102***

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1, 3, 5 and 7 are rejected under 35 U.S.C. 102(b) as being anticipated by Horio et al. (JP 2003-037302 A).

Regarding claims 1 and 3, Horio is directed to a thermoelectric semiconductor material (see [0019-0035] and [0047]) (figs. 1, 6, 7 and 9) produced by: adding excess Te to a predetermined stoichiometric composition of a compound thermoelectric semiconductor to form a raw alloy (see [0055], table 5, example 10); layering and packing plate shaped raw thermoelectric semiconductor materials 14 made of a raw alloy having a predetermined composition of a thermoelectric semiconductor to form a layered body; solidifying and forming the layered body to form a compact body 61 (see fig.9c); applying pressure by forging to the compact body 61 in a uniaxial direction that is perpendicular to a layering direction of the raw thermoelectric semiconductor materials 14, and thereby plastically deforming the compact body 61 by applying a shear force in a uniaxial direction parallel to the main layering direction of the raw thermoelectric semiconductor materials 14 (see figures 9c and [0035] and [0047]). Horio further teaches that the raw alloy in molten form is contacted with a surface of a cooling member (cooling roller 31) ((fig. 3 or 5) ([0026]) so as to form the plate shaped raw thermoelectric semiconductor materials having a thickness of at least 70 $\mu$ m (plate shaped rectangular parallelepiped has a thickness of greater than 70  $\mu$ m even after 20% reduction of the thickness after rolling) (see fig. 7-9) ([0048] and [0029-0035]).

Regarding claims 5 and 7, Horio further discloses that the stoichiometric composition of the compound thermoelectric semiconductor is a  $(\text{Bi-Sb})_2\text{Te}_3$  or  $\text{Bi}_2(\text{Te-Se})_3$  based composition ([0017] and [0023]).

**In an alternative, claims 1, 3, 5 and 7 are rejected as follows:**

Regarding claims 1, 3, 5, and 7, Horio discloses a plate shaped raw thermoelectric semiconductor materials having a thickness of at least  $70\mu\text{m}$  (rectangular parallelepiped plate has a thickness of greater than  $70\mu\text{m}$  even after 20% reduction of the thickness after rolling) (see fig. 7-9) ([0048] and [0029-0035]), wherein the stoichiometric composition of the compound thermoelectric semiconductor is a  $(\text{Bi-Sb})_2\text{Te}_3$  or  $\text{Bi}_2(\text{Te-Se})_3$  based composition ([0017] and [0023]). It is noted that the claims are product-by-process claims, therefore the claims are not limited to the manipulation of the recited method of forming the plate shaped raw thermoelectric semiconductor materials by layering and packing, solidifying, pressurizing, plastically deforming by shear force and cooling as claimed. The determination of patentability is based on the product, and not on the method (forming the plate shaped raw thermoelectric semiconductor materials by layering and packing, solidifying, pressurizing, plastically deforming by shear force and cooling as claimed) of making the product. “Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” See MPEP §2113. See also *In re Thorpe*, 777F.2d 695, 698, 227 USPQ 964,966 (Fed. Cir. 1985).

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***Claim Rejections - 35 USC § 103***

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

11. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

12. Claims 8-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuda et al. (US 6,274,802) in view of Horio et al. (JP 2003-037302 A).

Regarding claims 8 and 12, Fukuda is directed to a thermoelectric module comprising PN element pair (5 and 6) (fig. 12) (1: 26-37 and 2:35-10:5), produced by plastically deforming (see

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abstract) respectively plate shaped raw thermoelectric semiconductor materials made of a raw alloy comprising a composition of P type thermoelectric semiconductor, and plate shaped raw thermoelectric semiconductor materials made of a raw alloy comprising a composition of N type thermoelectric semiconductor to form P type and N type thermoelectric semiconductor materials (see abstract and fig. 12 and 12:25-16:24); cutting out P type and N type thermoelectric semiconductor elements 5, 6 from the P type and N type thermoelectric semiconductor materials (9: 59-62 and 12:25-16:24) so that planes perpendicular to film thickness can be used as contact surfaces with an electrode (7); arranging the P type and N type thermoelectric semiconductor elements (5 and 6) in a crystallographic orientation of high thermoelectric capacity; joining the P type and the N type thermoelectric semiconductor elements 5, 6 via a metal electrode 7 to form a PN element pair, said thermoelectric module having a structure provided with said PN element pair.

However, the reference is silent as to layering and packing respectively the raw thermoelectric semiconductor materials, and solidifying and forming them to form compacts; applying pressure to the compacts having the compositions of P type and N type thermoelectric semiconductor in an axial direction perpendicular to a main layering direction of the raw thermoelectric semiconductor materials; and thereby applying shear force in an axial direction parallel to the main layering direction of the raw thermoelectric semiconductor materials for plastically deforming manufacturing; and contacting raw alloy with a cooling member such to form plate shaped raw thermoelectric semiconductor material with a thickness of at least 70  $\mu\text{m}$ .

Horio is directed to a thermoelectric semiconductor material (see [0019-0035] and [0047]) (figs. 1, 6, 7 and 9) produced by: adding excess Te to a predetermined stoichiometric



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composition of a compound thermoelectric semiconductor to form a raw alloy (see [0055], table 5, example 10); layering and packing plate shaped raw thermoelectric semiconductor materials 14 made of a raw alloy having a predetermined composition of a thermoelectric semiconductor to form a layered body; solidifying and forming the layered body to form a compact body 61 (see fig.9c); applying pressure by forging to the compact body 61 in a uniaxial direction that is perpendicular to a layering direction of the raw thermoelectric semiconductor materials 14, and thereby plastically deforming the compact body 61 by applying a shear force in a uniaxial direction parallel to the main layering direction of the raw thermoelectric semiconductor materials 14 (see figures 9c and [0035] and [0047]). Horio further teaches that the raw alloy in molten form is contacted with a surface of a cooling member (cooling roller 31) ((fig. 3 or 5) ([0026])) so as to form the plate shaped raw thermoelectric semiconductor materials having a thickness of at least  $70\mu\text{m}$  (rectangular parallelepiped plate has a thickness of greater than  $70\mu\text{m}$  even after 20% reduction of the thickness after rolling) (see fig. 7-9) ([0048] and [0029-0035]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have utilized the method of Horio '302 in the thermoelectric module production method of Fukuda to manufacture P- and N-type thermoelements with high performance index (see abstract of Horio '302).

Regarding claims 9-11 and 13-15, Fukuda in view of Horio further disclose that the stoichiometric composition of the compound thermoelectric semiconductor is a  $(\text{Bi-Sb})_2\text{Te}_3$  or  $\text{Bi}_2(\text{Te-Se})_3$  based composition (see 16: 11-24 of Fukuda) (see also [0017] and [0023] of Horio '302).

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**In an alternative, claims 8-15 are rejected as follows:**

Regarding claims 8-15, Fukuda is directed to a plurality of p-type thermoelectric semiconductor element (p-type element 5) and a plurality of n-type thermoelectric semiconductor element (n-type element 6) joined via metal electrode (7) to form a plurality of PN element pair to form a thermoelectric module (fig. 12) (1: 26-37 and 2:35-10:5).

However, the reference is silent as whether the p-type and n-type semiconductor element comprises plate shaped raw thermoelectric semiconductor material with a thickness of at least 70  $\mu\text{m}$ .

Horio discloses a high performance index plate shaped raw thermoelectric semiconductor materials having a thickness of at least 70 $\mu\text{m}$  (rectangular parallelepiped plate has a thickness of greater than 70  $\mu\text{m}$  even after 20% reduction of the thickness after rolling) (fig. 7-9) ([0048] and [0029-0035]), wherein the stoichiometric composition of the compound thermoelectric semiconductor is a  $(\text{Bi-Sb})_2\text{Te}_3$  or  $\text{Bi}_2(\text{Te-Se})_3$  based composition ([0017] and [0023]). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have thermoelectric semiconductor material of Horio '302 in the thermoelectric module of Fukuda to form P- and N-type thermoelements with high performance index (see abstract of Horio '302).

It is noted that the claims 8-15 are product-by-process claims, therefore the claims are not limited to the manipulation of the recited method of forming the plate shaped raw thermoelectric semiconductor materials by layering and packing, solidifying, pressurizing, plastically deforming by shear force and cooling as claimed. The determination of patentability is based on the product, and not on the method (forming the plate shaped raw thermoelectric semiconductor

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materials by layering and packing, solidifying, pressurizing, plastically deforming by shear force and cooling) of making the product. “Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” See MPEP §2113. See also *In re Thorpe*, 777F.2d 695, 698, 227 USPQ 964,966 (Fed. Cir. 1985).

### ***Response to Arguments***

13. Applicant's arguments filed on 01/31/2011 have been fully considered but they are not persuasive.

On pages 1 and 2 of Remarks, Applicant argues that Horio fails to disclose plate shaped raw thermoelectric semiconductor material having a thickness of at least 70  $\mu\text{m}$ .

The Examiner respectfully disagrees. Horio discloses a high performance index plate shaped raw thermoelectric semiconductor materials having a thickness of at least 70 $\mu\text{m}$  (rectangular parallelepiped plate has a thickness of greater than 70  $\mu\text{m}$  even after 20% reduction of the thickness after rolling) (fig. 7-9) ([0048] and [0029-0035]).

### ***Correspondence/Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GOLAM MOWLA whose telephone number is (571) 270-5268. The examiner can normally be reached on M-Th, 0800-1830 EST.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, ALEXA NECKEL can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/G. M./

Examiner, Art Unit 1723

/Alexa D. Neckel/

Supervisory Patent Examiner, Art Unit 1723